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says: the sleeper opens an eye. 'Force is simply the expression of the rate or speed at which any change takes place in matter:' the eye closes.

The lecturer, building his hopes on the staring eyes of a young man in the front row and the rapidly running pencil of the young woman in the second, dilates upon the first two laws of motion, and approaches the third. He notices a frightened look in the young man's face, and that the pencil has stopped, and says, "Action and reaction are equal, but for present purposes it need not be here discussed."

It may be said that the book-binder's apprentice over the clock has been omitted from this account of the audience. That is very true; but it must be understood, when a popular lecture is given, that it passes right over the heads or through the heads of nearly all who are there; that the results are only to be found in the minds of a stray few. With this granted, one may acknowledge that the blue lights and red lights of the experiments may draw applause, but that the main result of the evening will be a restless sleep for the majority, and a pleasant pastime for a few.

With the fire of the experiments buried in the black and white of woodcuts, and the awakening influence of the speaker's voice gone, the same half-told facts appear weak when read from the pages of a book.

Mr. Carpenter states in his preface, that kind friends advised the publication of his lectures; but the lectures being of the class which hint at rather than discuss the problems of physics, and intended to lead the listener to think he is learning when he is only listening to pleasant chat, it would seem that this advice must have been of the kind which is not meant to be followed.

SOME STATE AGRICULTURAL EXPERIMENT-STATIONS.

Annual report of the Connecticut agricultural experiment-station for 1883. Printed by order of the legislature. New Haven, Tuttle, Morehouse, & Taylor, pr., 1884. 120 p. 8°.

Fourth annual report of the New Jersey state agricultural experiment-station for the year 1883. Vineland, Wilbur pr., 1883. 112 p. 8°.

THE report of the Connecticut station for 1883 presents a good illustration, both of the value of experiment-stations and of the rather narrow limits within which their activity has been in most cases thus far confined. This oldest of the American stations owed its origin to the demand for an efficient control of the

quality of commercial fertilizers. It was in its inception, and has remained to a large extent, a fertilizer-control station; and this, not from any lack of interest in the problems of agricultural science, nor from any incompetence on the part of its officers to solve them, but simply from force of circumstances.

During the winter of 1882-83 the station was without laboratory facilities, and the present report covers about nine months of work. Of its hundred and twenty pages, about seventy are devoted to fertilizers, two hundred and nineteen analyses of which are reported. "Nearly one-half of them are samples of complex composition, each one requiring six determinations in duplicate." The amount of work which this involves can be fully appreciated only by a chemist, but its effect in limiting the amount of other work done is obvious.

Aside from fertilizer analyses, we find in this report numerous tests of the vitality of seeds, together with a description of a new and convenient form of apparatus for the same; analyses of feeding-stuffs, and a table of the composition of American feeding-stuffs compiled exclusively from American analyses by Dr. E. H. Jenkins; analyses of the milk of Ayrshire cows, and of market milk; analyses of oak and chesnut leaves at different periods of growth; and divers minor matters, including notes on some analytical processes.

It will be seen, that, while considerable work other than fertilizer analysis has been done, it is all, so far as reported, laboratory work. Of experiments with living plants or animals, or even with the soil from which they draw their sustenance, we find no mention. As we have already said, this fact is largely, if not entirely, the result of unavoidable circumstances. We mention it here, not to find fault, but to express the hope, that, with its new equipment and increased income, the Connecticut station will find means and opportunity to enlarge the scope of its work, and attack some of the numerous problems in what we might call applied biology, which are waiting solution.

The report of the New Jersey station shows points of resemblance to, and of difference from, that of the Connecticut station. As in the former case, the largest draught upon the resources of the station has been for the analysis of fertilizers, a hundred and ninety-four of which have been examined. Unlike the Connecticut station, the New Jersey station had ready to its hand tolerably good facilities for conducting field and feeding experiments;

and to these, and the auxiliary chemical work which they involve, the residue of its energies has been directed. These experiments include comparisons of green rye with rye ensilage, and of dried fodder-corn with corn ensilage, as food for milch-cows; field trials with fertilizers on various crops and on various typical soils in the state; experiments upon sorghum as a sugar-producing plant, and preliminary work on sweet-potato disease.

Not all of these experiments are of the highest order; but they are accurate and painstaking, and they touch the actual interests of the farm more closely than any mere laboratory

work, however excellent, can do. The experiments on sorghum were mainly upon the effect of fertilizers upon the yield of sugar, and gave the interesting result that the yield of sugar was more favorably affected by potash than by any other single substance, and that, with the addition of nitrogen to the potash, the largest yield of sugar per acre was obtained. Sulphate of potash surpassed the 'muriate' in every case. Both sorghum bagasse and seed (the whole plant cut for fodder) and sorghum ensilage proved very satisfactory fodders for cows and pigs.

INTELLIGENCE FROM AMERICAN SCIENTIFIC STATIONS.

GOVERNMENT ORGANIZATIONS.

Geological survey.

Mineral springs in eastern Tennessee. — Mr. F. M. Pearson, who carried on topographic work for the survey last summer in eastern Tennessee, reports that the section of the state upon the map of which he is now engaged is full of mineral springs belonging to the classes of sulphur and chalybeate springs. He mentions particularly Bean's Station Valley, in Grainger and Hawkins counties, as being the locality of some twenty springs, a number of which have been improved, and are places of resort. On the north-western side of the valley lies the 'Poor Valley Ridge,' which extends for a distance of some thirty miles from the north-east to the south-west. This ridge is separated from the Clinch Mountain, which is on the north-west and parallel with it, by a depression or hollow known as 'Poor Valley.' In the latter, numerous small streams rise, separated by low divides, which, after flowing in the valley for short distances either south-west or north-east, turn and reach Bean's Station Valley through gaps in the Poor Valley Ridge. At every one of these gaps on the south-east side of the ridge, sulphur springs are found. Most of these springs are unimproved, as far as conveniences for using the waters are concerned; but those at which hotels have been built are among the most popular places of resort in the state. Beginning at the south-west, where the ridge abuts against the Clinch Mountain, the first springs of importance are 'Lee's Springs,' which are situated at the extremity of the Poor Valley Ridge, or rather partly between it and the Clinch Mountain. Powder Spring (named from the odor of the sulphuretted-hydrogen gas), at Powder Spring Gap, five miles farther to the north-east, is the next important locality. Following the ridge fifteen miles from this point, toward the north-east, brings one to 'Tates Springs,' one of the most noted localities in Tennessee. There are good accommodations here; and stages connect with the Eastern Tennessee, Virginia, and Georgia railroad

at Morristown. Stages connect 'Lee's Springs' with Strawberry Plains, a station on the same railroad.

Hale's red and white sulphur springs, in Hawkins county, five miles north of Rogersville, are also resorted to, and are on the same line as the other springs enumerated. There are also several chalybeate springs on or near the same line, in Hawkins and Grainger counties. Other well-known watering-places, determined by the presence of mineral springs, in the region surveyed by Mr. Pearson, are 'Montvale Springs' in Blount county, 'Oliver Springs' in Anderson county, 'Austin Springs' in Washington county, and 'Galbraith's Springs' in Hawkins county.

Burk's Garden, in Virginia. — The peculiar topographical system of long narrow valleys, with streams flowing from their opposite ends to the middle, and thence at right angles across or through one of its boundary ridges, which is one of the striking features of the physical geography of the country surveyed by Mr. Morris Bien in the southern Appalachians (described in *Science*, No. 56), gradually changes, as it is traced north-eastward from the valley of east Tennessee, until in Tazewell county, the northern county of south-western Virginia, is found the most southerly instance of a topographical feature common in Pennsylvania. This is Burk's Garden, a beautiful oval valley, eight miles long by four and a half miles wide. It is surrounded by a ridge averaging more than twelve hundred feet in height. The valley contains some of the richest blue-grass land in the state. Its drainage forms one of the heads of Wolf Creek, which affords numerous examples of sink-hole drainage, so common in the area surveyed by Mr. Bien. This stream leaves the valley by flowing through the western side of the oval range in a deep and rugged gap, or cañon as it would be called in the west. This valley well deserves the name of 'garden,' for it is one of the most beautiful spots in Virginia. The first glance recalls Johnson's description of 'Happy Valley' in Rasselaï, and it is without doubt destined to become a popular mountain resort.